

DMA Toolkit

Section II

Preparing for the DMA

- ✓ Idaho Mathematics Achievement Standards
- ✓ Strategies for Teachers
- ✓ Advice for Students
- ✓ Two Ways to Evaluate Student Learning
- ✓ Problem-Solving Strategies
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IDAHO MATHEMATICS ACHIEVEMENT STANDARDS

I. BASIC ARITHMETIC, ESTIMATION, AND ACCURATE COMPUTATIONS

- A. Understand and use numbers.
- B. Perform computations accurately.
- C. Estimate and judge reasonableness of results.

II. MATHEMATICAL REASONING AND PROBLEM SOLVING

- A. Understand and use a variety of problem-solving skills.
- B. Use reasoning skills to recognize problems and express them mathematically.
- C. Apply appropriate technology and models to find solutions to problems.
- D. Communicate results using appropriate terminology and methods.

III. CONCEPTS AND PRINCIPLES OF MEASUREMENT

- A. Understand and use customary and metric measurements.
- B. Apply concepts of rates and other derived or indirect measurements.
- C. Apply the concepts of ratios and proportions.
- D. Apply dimensional analysis.
- E. Perform error analysis.

IV. CONCEPTS AND LANGUAGE OF ALGEBRA

- A. Use algebraic symbolism as a tool to represent mathematical relationships.
- B. Evaluate algebraic expressions.
- C. Solve algebraic equations and inequalities.
- D. Solve simple linear systems of equations or inequalities.

V. CONCEPTS AND PRINCIPLES OF GEOMETRY

- A. Apply concepts of size, shape, and spatial relationships.
- B. Apply the geometry of right triangles.
- C. Apply graphing in two dimensions.

VI. DATA ANALYSIS, PROBABILITY, AND STATISTICS

- A. Understand data analysis.
- B. Collect, organize, and display data.
- C. Apply simple statistical measurements.
- D. Understand basic concepts of probability.
- E. Make predictions or decisions based on data.

VII. FUNCTIONS AND MATHEMATICAL MODELS

- A. Understand the concept of functions.
- B. Represent equations, inequalities and functions in a variety of formats.
- C. Apply functions to a variety of problems.

Note: Some standards are not appropriate for certain grade levels. Please consult a complete version of the K-12 Idaho Achievement Standards for specifics. Documents are available for downloading at: <http://www.idahoboardofed.org/saa/index.asp>

Strategies for Teachers

1. Learn more about the DMA.
 - ◆ Participate in state-sponsored inservice workshops and training.
 - ◆ Attend the DMA presentations at the Idaho Council of Teachers of Mathematics (ICTM) Fall Conferences.
 - ◆ Request DMA inservice through the State Department of Education Math Coordinator contacting them by phone (208-332-6932).
2. Invite a scorer from a previous year to share insights and how these assessments have affected his/her math instruction.
3. Provide copies of scoring standards to students, other teachers, and parents.
4. Present a workshop for parents in which scoring standards and anchor papers are discussed, and questions are answered.
5. Provide students with opportunities to practice problem solving and responding to practice prompts and practice assessments including assessments from previous years. Allow students to score their own papers using the scoring standard.
6. Encourage all mathematics teachers to use scoring standards, or parts of it (when appropriate) to assess math assignments.
7. Ask students to explain the DMA to parents using their papers, the scoring standard, and anchor papers.
8. Score papers for the DMA and share your insights and conclusions with other faculty.
9. Hold a school-wide math assessment. Develop prompts, administer the assessment, and using the DMA scoring standard, find anchor papers, and score the papers. Invite parents, students, and community members to help score the papers.
10. Discuss higher level thinking skills with students. Encourage them to consider problem solving strategies and processes, and to explain these orally and in writing.
11. Ask students to make up their own prompts. Discuss these as a class and collect good samples for future practice.
12. Using copies of anchor papers, invite students to compare their work to anchor papers and explain similarities and differences. Ask them to use the anchor papers to set concrete goals for their own mathematics improvement.
13. Following the assessment, make copies of student responses for comparison with scores when the results arrive. These comparisons will improve teacher's instruction and understanding of the assessment.
14. Refer to the appropriate *Mathematics Terms and Vocabulary*, *Problem Solving Strategies*, and *Skills and Content Strands* documents to align instruction and curriculum with the assessment.

Advice for Students

Preparing for the Direct Mathematics Assessment

Appearance

DO write and organize your work so it is easy to read and follow.

DON'T be overly concerned with handwriting or spelling. They do not enter into scoring unless they hinder communication.

Communication

DO show your work and justify your answers. Use appropriate mathematical symbols and terms.

DON'T think that longer answers are always better.

Example:

DO write $12 + 10 + 5 = 27$

Example:

DON'T write "First I took the twelve, then I added the ten, then I added the five and got twenty-seven."

Assessment Strategies

DO practice taking sample assessments. Complete as much of the first problem as you can. Then skim the remaining problems and choose the ones that best demonstrate your abilities.

DON'T think you need to do every problem in the order it is written on the assessment.

Example:

DO attempt to answer all parts of the questions you select.

Example:

DON'T spend too much time on any one problem. If you are having trouble, move on to another question.

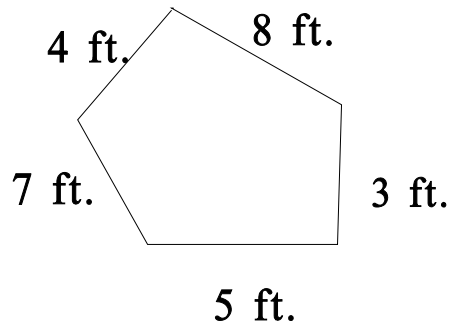
Note to teacher: Holistic scoring takes into consideration all work shown on the assessment unless it is crossed out or erased. If students work on all prompts *after* the first page of the assessment and decide that one prompt does not demonstrate their best work, students may cross out all work done on that prompt.

Two Ways To Evaluate Student Learning

Here is how two methods of evaluation assess the same content strand. The first seeks the right answer. The second measures understanding concepts.

Standardized Test Multiple Choice Assessment

What is the perimeter of the pentagon below:



- a) 70 ft.
- b) 27 ft
- c) 3360
- d) 5 ft
- e) none of the above

In this example, the student may successfully answer the question without understanding any of the terms or underlying mathematics involved. Many students would be able to correctly guess the answer.

For those students who do know the terms and concept, basic addition is the only skill this problem assesses, as it is the only one required to answer the question.

Standardized Test Direct Assessment (Open-Ended)

Draw a pentagon with a perimeter of 73 feet and label the lengths of each side.

This prompt represents an open-ended problem. The student may answer the question in a variety of ways. The response will give greater insight about the student's understanding of perimeter and pentagon. The strategies and processes he\she uses will also reveal the sophistication of their thinking skills. This type of question does not ignore computation but integrates it into finding a solution.

Suggested Problem-Solving Strategies To Teach Your Class

When students encounter a math problem they can't immediately solve, have them try one or more of the following:

1. Use a graph, table, drawing, or pattern.
2. Make a list or a table.
3. Eliminate possibilities.
4. Guess and check/experiment.
5. Work backwards (inverse operations).
6. Use objects.
7. Use logic.
8. Use an equation/formula.
9. Solve a simpler problem.
10. Recognize and use appropriate technology.

Problem-solving strategies should be integrated throughout all of the content strands.

Communication is key!

Emphasize skills that enable students to communicate results using appropriate terminology and methods.

Idaho Direct Mathematics Assessment Scoring Standard

4 Advanced: Exceeds Standards

A score of 4 indicates that the student is exhibiting above grade-level processes for determining solutions and demonstrates higher-order thinking skills. The student demonstrates advanced understanding of the problem/situation presented. The student recognizes the situation and is able to determine which processes will best solve it. A score of 4 indicates that the student completes the processes appropriately, determines the solutions accurately, and communicates effectively. Solutions are reasonable and well-defended.

3 Proficient: Meets Standards

A score of 3 indicates that the student is performing at grade level in mathematics. Student responses exhibit evidence of adequate or thorough understanding of the problem/situation presented. The student adequately communicates correct problem-solving strategies, although there may be some computational or surface errors which do not interfere with correct processes. Proficient thinking skills and process is apparent. Structure of responses is well-defined and adaptable. A 3 paper exhibits proficient mathematical achievement at grade level.

2 Basic: Below Standards

A score of 2 indicates that the student is progressing toward grade level in mathematics. The student struggles to communicate effectively. However, responses do exhibit limited evidence of understanding. Although basic thinking skills and purposes are apparent, computational skills, problem-solving strategies, and process development are limited. Frequent surface errors and lack of structure detract from mathematical achievement at grade level.

1 Below Basic: Significantly below standards

A score of 1 indicates that the student is demonstrating significantly below grade level performance in mathematics. The student shows significant difficulty with basic mathematics concepts as well as with implementing problem-solving strategies. Although the student may attempt to solve most problems, computational skills, basic thinking skills, structure, and process development are severely lacking. Frequent errors and lack of communication skills are obvious. A score of 1 may indicate that the paper shows insufficient (minimal or non-existent) evidence of limited development toward grade-level proficiency or is blank or illegible.

4 papers exhibit most of the following:

- * Advanced application of basic skills
- * Advanced understanding of situations
- * Advanced mathematical vocabulary, use of symbols and communication skills
- * Higher-order thinking skills (analysis, synthesis, and evaluation)
- * Appropriate processes accurately completed
- * Effective problem-solving strategies
- * Minimal or non-existent errors
- * Innovation and creativity

3 papers exhibit most of the following:

- * Proficient application of basic skills
- * Understanding of situations
- * Effective mathematical vocabulary, use of symbols and communication skills
- * Adaptable processes
- * Effective problem-solving strategies
- * Occasional computational or surface errors
- * Adequate solutions and processes
- * Well-defined structure

2 papers exhibit most of the following:

- * Development toward proficiency of basic skills
- * Limited understanding of situations
- * Limited mathematical vocabulary, use of symbols and communication skills
- * Demonstrates basic use of thinking skills
- * Limited use of problem-solving strategies
- * Frequent computational or surface errors
- * Limited process development
- * Limited structure

1 papers exhibit most of the following:

- * Minimal development of basic skills
- * Minimal evidence of understanding of situations
- * Inadequate mathematical vocabulary, use of symbols and communication skills
- * Minimal use of basic thinking skills
- * Lack of process development
- * Minimal problem-solving strategies
- * Numerous computational errors
- * Inappropriate processes
- * Significant lack of structure

Scoring Standard for Students

4 Advanced

A score of 4 shows that you have an advanced understanding of math skills and processes needed to solve the problems. You showed advanced ability to explain and show what you know. You included clear and understandable steps in getting your answer. Problem solving strategies were used well in reaching your solution. There were few or no mistakes.

3 Proficient

A score of 3 shows that you have an understanding of math skills and processes to solve the problems. Problem solving strategies are correct. Your answers were explained well, though you may have made a few mistakes.

2 Basic

A score of 2 shows that you are beginning to use basic skills and process to solve problems. You may have tried to use problem solving strategies, but they are often not correct or do not fit the situation. The steps are difficult to follow and there are many mistakes.

1 Below Basic

A score of 1 shows that you have a hard time understanding the problems and using math skills to solve them. You did not choose a correct way to solve the problems. Your answers were incorrect or did not fit the problem. You may have even left the paper blank or your work could not be read.